

ENGINEERING SOYBEAN TO REDUCE SEED PHYTATE CONTENT

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Phytate, the storage form of seed phosphorus, comprises more than 1% of seed weight and more than 60% of total seed phosphorus. Phytate affects the nutritional quality of agriculturally important crops such as soybean (*Glycine max*). Soybean meal, which is used for its protein content, contributes phytate to animal feed. From a nutritional aspect, phytate is poorly digested by non-ruminants, which results in the excretion of phosphorus and the associated environmental phosphorus pollution. In addition, phytate is considered to be an anti-nutrient due to its ability to bind and reduce the bioavailability of mineral cations such as iron and zinc. In seedlings, phosphorus required during germination is released from phytate by the activity of the enzyme phytase.

A transgenic approach was taken to reduce phytate in mature soybean seed. The soybean phytase gene (*GmPhy*) was expressed during seed development to degrade accumulating phytate in the seed. Embryogenic soybean cultures were transformed with an expression vector containing the soybean phytase cDNA controlled by the seed-specific β -conglycinin promoter (α' -subunit). A low copy transformant was recovered and progeny were grown for three additional generations. Developing T₂ and T₃ seeds from transgenic plants were analyzed for phytase activity and mRNA, respectively. Mature T₄ seed was tested for available P and phytate content. Phytase expression during seed development led to an average a 3-fold increase in available P and an 8% reduction in phytate content. Expression of phytase during seed development offers a promising strategy for improving phosphorus availability while reducing phytate content in soybean seed.